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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/905,450	07/13/2001	Yoshiaki Iwai	112857-276	5812

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EXAMINER

NATNAEL, PAULO S M

ART UNIT PAPER NUMBER

2614

DATE MAILED: 10/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/905,450	Applicant(s) IWAI ET AL.	
	Examiner Paulos M. Natnael	Art Unit 2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6-12 is/are allowed.
- 6) ☒ Claim(s) 1 is/are rejected.
- 7) ☒ Claim(s) 2-5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1 is again rejected under 35 U.S.C. 103(a) as being unpatentable over Matsugu et al., U.S. Pat. No. 6,621,921.

Considering claim 1, Matsuga et al discloses all claimed subject matter, note;

a) an image holding device for holding images obtained by shooting a plane, where a known pattern is drawn, ... at at least three view points free from any spatial positional restriction, is met by image storage section 11, Fig.1B, which holds or stores image data taken by the two cameras 6 at arbitrary viewpoints. (see Abstract, col. 8, lines 40-47, and Fig.8)

b) a parameter calculating device for calculating parameters necessary for distance measurement in the stereo system based on the images held by the image holding part, is met by the main controller 10 (fig.1B) and/or Image processing means 4 (fig.1A), which may be built in the image pick-up means 1 (see col. 5, lines 62-64), which

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controls the image-pickup parameter estimation, distance measurement and calculation.

(See Fig.8; col. 8, lines 7-10, 28-39; col. 9, lines 23-30, 37-43, and 59-62)

Except for;

c) the claimed with "base" camera and "detection" camera;

Regarding c), Matsugu et al. discloses two cameras taking images of the plane 2 from two different positions or angles. Matsugu et al however does not specifically disclose which one is the base and which is the detection camera. Nevertheless, it would have been obvious to the skilled in the art at the time the invention was made to modify the system Matsugu et al. by choosing one or the other cameras 6 as a base camera and designate the other as a detection camera, so that the images taken are distinguishable from one another or are easily known to the operator.

Response to Arguments

3. Applicant's arguments filed Jun 18, 2004 have been fully considered but they are not persuasive. Response follows.

Applicant's Arguments

a) Applicants believe that the Matsugu reference is deficient with respect to the claimed invention as defined by claim 1 for at least a number of reasons. For example, Applicants believe that Matsugu fails to disclose or suggest shooting with a base camera and a detection camera at three or more view points free from any spatial positional restriction as required by the claimed invention and discussed above. Indeed,

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Matsugu merely provides a predetermined image pattern whose shape and position are known. See, Matsugu, for example, claim 1.

b) In contrast, the present invention enables determination of internal parameters without shape and position data of image pattern and position data of view point by using a shoot image pattern at three view points. In this regard, internal parameters are defined, for example, in matrix A in equation 2 as disclosed in the specification on page 11. The internal parameters can be obtained according to the procedure as further disclosed in the specification, for example, at page 18. Six constraints are necessary to obtain the internal parameters since the internal parameters include five parameters as defined in matrix A as discussed above. The three shoot images produce six constraints since one image produces two constraints as disclosed, for example, in equation 12 or equation 14 of the specification. Therefore, the three shoot images are necessary to obtain the internal parameters. Again, nowhere does Matsugu disclose or suggest such features as required by the claimed invention.

Examiner Response

a) Matsugu et al. disclose an image processing apparatus in which a plurality of images obtained by photographing a three-dimensional object from a plurality of viewpoints are integrated by using image-pickup parameters such as position, pose, focal lengths, and aberration information of a camera at these viewpoints, thereby integrating shapes at arbitrary viewpoints of the three-dimensional object. The word "arbitrary" is defined as

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something “not fixed”, “not restrained, or limited”. (Merriam Webster’s Collegiate Dictionary, 10th edition) Although image-pick up parameters such as position and focal lengths, for example, taken into consideration, the arbitrariness of the (not only three, but) plurality viewpoints, not restrained or limited by position or similar factor, is clear in Matsugu’s invention.

Matsuga further teaches that “after estimation of image-pickup parameters with reference to the left-camera image is performed, estimation of image-pickup parameters with reference to the right-camera image is performed by using, as initial values, the image-pickup parameters obtained with reference to the left-camera image, or the above processes are repeated until a variation in estimation value becomes a threshold value or less. The processes are to improve accuracy and test the estimation value, and the order of the processes is not limited to a specific order. In order to stably and reliably perform step (S2-1), the known pattern area should preferably have features different from those on the object 3 (e.g., different in hue, reflectance, spatial frequency, or the like). In image-pickup parameter recording process (S2-4), image-pickup parameters corresponding to object image data are recorded on a recording medium (not shown) such as a (magneto-optical) magnetic disk or a magnetic tape of the predetermined storage means 12 together with image data in a predetermined format in which the correspondence of these image-pickup parameters is clear.” (col. 9, lines 23-36; see also Fig. 5) [emphasis added]

The argument that Matsugu fails to disclose or suggest shooting with a base camera and a detection camera at three or more view points free from any spatial positional restriction, therefore, is unpersuasive.

b) Applicant's representative is arguing something that is not in the claims. The equations 12 and 14 and Matrix A are not recited in claim 1. Besides, the Matrix A describes internal parameters such as lens distortion of the camera at an ideal condition. On page 18, the position and posture of the shot plane in space are presumed by using the internal parameters of the base camera. Argument that the three shoot images are necessary to obtain the internal parameters and Matsugu disclose or suggest such features as required by the claimed invention, is unpersuasive.

Allowable Subject Matter

4. Claims **6-12** are allowable over the prior art.
5. Claims **2,4** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
6. Claims **3 and 5** would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to disclose a camera calibration technique wherein a parameter calculating device comprises: a first part for presuming distortion parameters of the base camera and the detection camera by the use of the shot images; a second part for calculating projective transformation matrixes to project the shot images respectively onto predetermined virtual planes; a third part for calculating internal parameters of the base camera on the basis of the projective transformation matrixes obtained by the second part with regard to the images from the base camera; a fourth part for presuming the position of the shot plane based on both the internal parameters of the base camera calculated by the third part and the images obtained from the base camera; and a fifth part for calculating projection matrixes for the detection camera based on both parameters of the plane position presumed by the fourth part and the images obtained from the detection camera, as in claim 2; a camera calibration method for calibrating a stereo system, which includes a base camera and a detection camera, by using images obtained by shooting a plane, where a known pattern is drawn, with the individual cameras at at least three view points free from any spatial positional restriction, the method comprising the steps of: presuming distortion parameters of the base camera and the detection camera by using the images thus obtained; calculating projective transformation matrixes to project the images respectively onto predetermined virtual planes; calculating internal parameters of the base camera based on the projective transformation matrixes obtained during the step of calculating projective transformation matrixes with regard to the images from the base camera;

presuming the position of the shot plane based on both the internal parameters of the base camera calculated at the step of calculating internal parameters and the images obtained from the base camera; and calculating projection matrixes for the detection camera based on both parameters of the plane position presumed at the step of presuming and the images obtained from the detection camera, as in claims 6 and 10.

Conclusion


8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paulos M. Natnael whose telephone number is (703) 305-0019. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Miller can be reached on (703) 305-4795. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


PMN
October 1, 2004


MICHAEL H. LEE
PRIMARY EXAMINER